

Strangelove Ocean at Era Boundaries, Terrestrial or Extraterrestrial Cause

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A negative perturbations in carbon-isotope value of calcite in pelagic sediments has been found at times of biotic crisis, marking horizons which are, or have been proposed as era boundaries: Cretaceous/ Tertiary (K/T), Permian/Triassic (P/T), and Precambrian/Cambrian (PreC/C).. The anomaly has also been found at several other mass-extinction horizons, such as terminal Ordovician, Frasnian-Famenian, etc. Studies of K/T boundary indicate that only the planktic fraction of the sediments has the negative isotope anomaly, whereas the benthic fraction has the same value across the boundary. This geochemical signal is thus considered a record of strangelove ocean, or an ocean where isotope fractionation of dissolved carbonate ions in surface waters (by biotic function of planktic organisms) has been significantly reduced because of the drastic reduction of the biomass in the oceans.

The reduction of marine biomass at each of the era boundaries has been related to chemical pollution of the oceans as a consequence of a catastrophic event; a pH decrease of 0.5 could inhibit the fertility of planktons. A change toward a more acid ocean could either be a consequence of a catastrophic volcanic explosion or of a meteorite- impact. Carbon dioxide from volcanism or NO_x from mushroom cloud rising above impact site could theoretically reduce the pH value of seawater. Head-on collision with long-period comet at some 50 km/s would fulfill the energy requirement to produce enough pollutants to make a largely infertile ocean. No quantitative estimates have been made on the size of volcanic explosion that had to take place in order to produce sufficient pH change to inhibit plankton productivity.

Studies of earthquakes, volcanic eruptions, and meteorite-impact occurrences have indicated a linearly inverse log/log relationship between the magnitude and frequency of events. The largest probable earthquake takes place every 10^3 - 10^4 years, the largest probable volcanic eruption takes place every 10^6 - 10^7 years, and the most energetic meteorite impact takes place every 10^8 - 10^9 years. The frequency of era boundaries in geologic history supports the postulate that the rare events causing those biotic crises were large bolide-impacts.